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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002953538 for a patent by GARY YEWDALL and GRAHAM PICKERING as filed on 23 December 2002.

WITNESS my hand this
Twentieth day of January 2004

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CLAIMS

1. A valve of a cleanable design capable of maintaining unfavourable conditions for microbial activity on the downstream side and/or outlet of the valve, said valve comprising:
    - A smooth and contoured body with an integral upstream connector, downstream connector and defined fluid flow path;
    - A flexible sealing membrane being:
        i. Selectively moveable into contact with the said valve body to close said valve;
        ii. Selectively moveable out of contact with the said valve body to open said valve.
        iii. Selectively operable to a range of positions to vary the flow rate of fluid through said valve;
    - Defined internal shape that allows the fluid to drain out of the said valve body;
    - An elongate heater secured into said valve body in a location so as not to be in contact with the fluid or disrupt the internal smooth and contoured body, said heater being operative to heat the valve body to a predetermined temperature.
2. A valve as set forth in Claim 1 capable of raising the temperature at the outlet of closed said valve to promote drying by reducing surface tension of the fluid for better draining, and by increasing evaporation.
3. A valve as set forth in Claim 2 capable of raising the temperature on the downstream side of said valve above 60°C.
4. A valve as set forth in Claim 3 with an down stream connector contoured and smooth to promote free draining including a small discontinuity to break surface tension.
5. A valve as set forth in Claim 4 with a thermodynamic external body shape to maximise achievable temperature in the downstream side and downstream connector of the said valve.
6. A valve set forth in Claim 5 with a polymeric insulating coating, which can be colour coded, covering the valve body and outlet connector.
7. A valve of cleanable design capable of regulating and or supplying a selected quantity of medium that possesses enhanced properties at elevated temperatures, said valve comprising:
    - A smooth and contoured body with an integral upstream connector, downstream connector and defined flow path;
    - A flexible sealing membrane being:

i. Selectively moveable into contact with the said valve body to close said valve;

ii. Selectively moveable out of contact with the said valve body to open said valve.

iii. Selectively operable to a range of positions to vary the flow rate of medium through the valve;

- Defined internal shape that allows the medium to drain out of the said valve body;
- An elongate heater secured into said valve body in a location so as not to be in contact with the medium or disrupt the internal smooth and contoured body, said heater being operative to heat the valve body to a predetermined temperature.

8. A valve as set forth in Claim 7 capable of raising the temperature of said valve body around the downstream side of the metal sealing face that comes into contact with the flexible sealing membrane to above 100 °C.

9. A valve as set forth in Claim 8 with a thermodynamic external body shape to maximise the heat into the metal sealing face that comes into contact with the flexible sealing membrane.

10. A valve set forth in Claim 9 with a polymeric insulating coating, which can be colour coded, covering the valve body inlet and outlet connectors.

11. Valve of cleanable design capable of maintaining the temperature of the metal sealing face that comes into contact with the flexible sealing membrane of said valve at an elevated temperature to assist in achieving sterilisation or decontamination conditions on the upstream side of said valve being heat treated by a suitable process, said valve comprising:

- A smooth and contoured body with an integral upstream connector, downstream connector and defined flow path;
- A flexible sealing membrane being:

  i. Selectively moveable into contact with the said valve body to close said valve;

  ii. Selectively moveable out of contact with the said valve body to open said valve.

  iii. Selectively operable to a range of positions to vary the flow rate of fluid through the valve;

- Defined internal shape that allows the fluid to drain out of the said valve body;
- An elongate heater secured into said valve body in a location so as not to be in contact with the fluid or disrupt the internal smooth and contoured body, said heater being operative to heat the valve body to a predetermined temperature.

12. A valve as set forth in Claim 11 capable of raising the temperature of said metal sealing face that comes into contact with the sealing membrane to above the sterilisation temperature of at least 121°C.

13. A valve as set forth in Claim 12 with a thermodynamic external body shape to maximise the heat into the metal sealing face that comes into contact with the flexible sealing membrane.

14. A valve set forth in Claim 13 with a polymeric insulating coating, which can be colour coded, covering the valve body and outlet connector.

DESCRIPTION

Field of the Invention

The invention relates to a smooth and contoured heated valve capable of:

- Providing a dry and biostatic environment on the downstream side and/or outlet of the valve.
- Throttling and isolating fluids best handled in a cleanable valve, possessing enhanced properties at elevated temperatures;
- Assist in maintaining sterilising conditions on the process contact side of a valve attached to sterilising apparatus

Background of the Invention

A typical application for the cleanable heated valve is in process industries that require a supply of high purity water within prescribed contamination limits supplied in custom designed systems with specific materials, finishes, process conditions and cleaning requirements, where cleaning can range from simple common cleaning methods to sanitisation and or sterilisation.

Quite often high purity water is required for specific operations in a number of industries, and is required to be supplied at various flow rates through smooth easy to clean valves. Whilst there are commercially available techniques to maintain water quality within the closed piping system, maintaining unfavourable conditions for microbiological activity in the downstream side of the valve and valve outlet that is exposed to the environment, can be a problem especially in systems below 60°C.

The moist, cold to warm environment of the discharge side of the valve and valve outlet, which is exposed to the room air, provides an ideal atmosphere for microbiological activity. Depending upon the size of the outlet and the temperature of the water it is possible for a plug of water to hold-up in the nozzle when not in use further aggravating the problem.

It is possible to steam sterilise the downstream side of the valve and outlet prior to use but this requires more valves, a pure steam supply and associated hardware. It is also not practical to steam sterilise a valve outlet where the water is frequently required. Steam can also be a safety hazard and for the abovementioned reasons steam is not a good general solution to the problem. It is also possible to sanitise the outlet by a number of methods including hot water, chemicals and oxidising agents. Like steam, these methods introduce complications and can only be effective during the sterilisation/sanitisation cycle once removed or when the outlet is reused contamination can begin to reoccur.

Another typical application for the cleanable heated valve is in process industries where there is a need to supply, isolate or regulate the flow of fluids that exhibit enhanced properties at elevated temperatures, in smooth cleanable valves.

A typical example could be the transfer of food products that are processed in systems of specific materials, finishes and clean-ability requirements. Another example could be the transfer of a product that is a liquid above a specific temperature but solidifies below that specific temperature or liquids that tend to create cleaning difficulties at certain temperatures and require cleanable systems including valves.

Another typical application for the cleanable heated valve is isolation valves at the boundary of systems or heat treatment apparatus containing items, products, medium, waste or the like being heat treated, sterilised or decontaminated. It is usually necessary to demonstrate that the required treatment temperature is achieved in all exposed internal regions of the said system or heat treatment apparatus. Quite often these said systems or heat treatment apparatus contain valves to serve a multitude of purposes. Said valves can often provide "cold spots" in such applications due to the mass of metal exposed to the colder outer environment making it difficult to achieve the required treatment temperatures.

In the abovementioned applications it is typical to externally wrap the piping and/or valves and the like with electrical heated wire coils or small bore steam piping, known as heat tracing, or to use steam jackets. Whilst these techniques are successful on interconnecting pipes it is difficult to provide enough energy from the outer exposed surfaces to heat-up the thick mass of metal found in smooth cleanable type valves to achieve the required temperatures on the inside surfaces of the valve. Heat tracing and associated protection coverings when applied to valve bodies can be bulky, difficult to apply efficiently and difficult reapply after removal for maintenance and can create external cleaning issues in hygienic industries.

There are patents existing for heated valves in the casting molten metal industry, refer US Pat No; 5 752 562, 5 531 245

The valves covered in the above mentioned patents comprise of internal joints, crevices, sliding grooves and attachments known as nooks and crannies. Nooks and crannies provide areas for microbiological contamination to hide and harbour, product to lodge and create difficulties for cleaning, making them unsuitable for hygienic industries or where cleaning or sterilisation is an issue. The design of these said valves for the molten metal industry could also contain "cold spots" due to changes in material and limited contact with the metallic body of the heating element. Also given that the heating element is in contact with the process fluids there are potential issues with localised hot spots that can denature proteins and certain food products, gaps where product and wastes can lodge between the heater and valve body, as well as material compatibility, surface finish, certification and traceability required for the food and health science industries.

Summary of the Invention

The present invention addresses the shortcomings discussed with the current processes and prior inventions. It is an object of the present invention to provide a cleanable heated valve capable of achieving conditions in the downstream side of the valve and outlet that are unfavourable for microbiological activity by assisting in the

drying process of the downstream side of the valve body and outlet and maintaining said valve areas dry and at an elevated temperature after use.

It is another object of the present invention to provide a cleanable heated valve that is compact, elegant, simple to use and is available for use as required.

It is another object of the present invention to provide a cleanable heated valve for regulating or supplying medium that exhibit enhanced properties at elevated temperatures by providing sufficient temperature conditions inside the valve as required by the medium for flow and sufficient temperature across the metal sealing face that comes into contact with the flexible sealing membrane.

It is another object of the invention to provide a cleanable heated valve with a polymeric colour coating in selective areas to, minimise the surface temperature for personnel safety, maximise the heat into the valve body and downstream connector and to allow colour coding of valves.

It is another object of the present invention to provide a cleanable heated valve to handle medium that exhibit enhanced properties at elevated temperatures that tend to stick to surfaces or valve discontinuities when hot, or as a result of cooling, or that require stringent cleaning. It is another object of the present invention to provide a heated valve that is smooth, cleanable and able to be constructed from traceable materials suitable for handling of medium for regulated industries such as food, biotech, pharmaceuticals, health sciences and the like.

It is another object of the present invention to provide a cleanable heated valve for systems or heat treatment apparatus containing items, products, medium, waste or the like being heat treated, sterilised or decontaminated, said valve to enable the required temperature to be achieved including the body of said valve exposed to the internal heat treated envelope.

The present invention has an internal smooth and contoured body with an integral upstream connector, downstream connector and defined fluid flow path. The smooth and continuous nature of said valve body allows for thorough cleaning by a range of commercial methods. There is a flexible sealing membrane being:

i. Selectively moveable into contact with the said valve body to close said valve;

ii. Selectively moveable out of contact with the said valve body to open said valve.

iii. Selectively operable to a range of positions to vary the flow rate of fluid through said valve;

Said flexible sealing membrane can remain in place for Clean In Place methods or removable for hand cleaning.

The internal surface of the valve body has a defined shape that allows the medium to drain out of the said valve body if required.

There is an elongate heater secured into said valve body in a location so as not to be in contact with the fluid or disrupt the internal smooth and contoured body, said heater being operative to heat the valve body to the temperature dictated by the process.

When the cleanable heated valve is to be utilised as a plain outlet, the downstream connector can be contoured and smooth to promote free draining including a small discontinuity to break surface tension, to further aid draining.

The heated cleanable valve has a thermodynamic external body shape to maximise achievable temperature into the metal sealing face that comes into contact with the flexible sealing membrane and the downstream side and down stream connector of the said valve.

DESCRIPTION OF THE EMBODIMENTS

Embodiments of the present invention are described, by way of example only, by reference to the accompanying drawings, it should be noted that the following description is not intended as limiting the broader aspects of the present invention.

Figure 1 is a 3-Dimensional view of a cleanable heated valve body in accordance with the present invention.

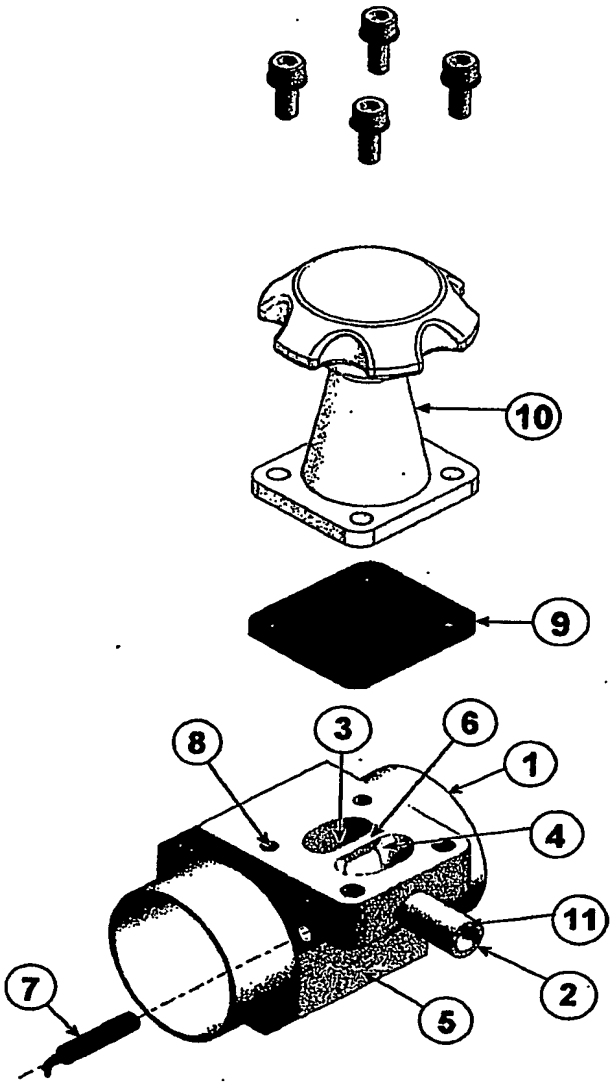

Figure 1

The upstream connector (1), shown attached to the cleanable heated valve body (5), is represented as a perpendicular flow line close coupled to the upstream contoured void (3). It should be appreciated, however, that the upstream connector is an attachment to supply the medium to the cleanable heated valve body and therefore can take a number of other forms other than that displayed, including but not limited to; another connected valve, plain inlet tube or pipe, associated tube or pipe fittings, vessel or tank wall, wall of sterilising apparatus or the like.
The downstream connector (2) shown attached to the cleanable heated valve body (5) is represented as a plain outlet type nozzle. It should be appreciated, however, that the down steam connector is an attachment to discharge the medium from the clean line heated valve body and therefore can take a number of other forms than that displayed, including but not limited to; another connected valve, perpendicular flow line close coupled to the downstream contoured void (4), plain inlet tube or pipe, associated tube or pipe fittings, vessel or tank wall, sterilising apparatus wall or the like.
The upstream flow-path is defined by an upstream contoured void (3) through which the medium will pass from the upstream connector over the sealing face (6) and through the cleanable heated valve body (5) when the sealing membrane (9) is lifted by operating the flow activation knob (10). The downstream flow-path is defined by a downstream contoured void (4) through which the medium will flow through the cleanable heated valve body (5) from the upstream contoured void (3) over the sealing face (6) into the downstream connector (2) when the sealing membrane (9) is lifted by operating the flow activation knob (10), shown as being suited to manual activation, but may also be automatic such as pneumatic or electronic or the like.

The cleanable heated valve body defines the medium flow path and contains fixing holes (8) to enable the sealing membrane and flow activation knob to be securely attached to the valve body.

Figure 2 is a Cross Sectional View of the cleanable heated valve body.

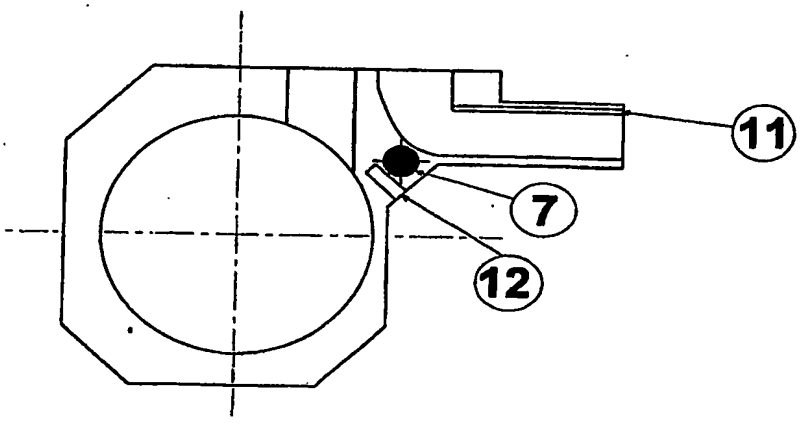

Figure 2

To raise the temperature of the cleanable valve to achieve the desired conditions there is a cylindrical heating element (7) securely fixed into the heated valve body powered by electrical wires. The heating element is positioned so as to not penetrate

the smooth cleanable inner surface of the valve nor come into contact with the medium inside or passing through the valve. Where the cleanable heated valve is to be utilised as an outlet to provide a medium free of microbiological contamination, the down stream connector plain outlet type nozzle (2) can be optionally contoured on the upper portion of said nozzle, as shown (11) to help assist in unlocking any held-up medium in the nozzle when the valve is closed in order to promote rapid free draining of the nozzle.
The lower portion of the cleanable heated valve body, between the upstream connector and the cylindrical heating element, can be contoured to remove metal for the applications where cool medium is flowing in the upstream connector in order to maximise the temperature across the metal sealing face, downstream contoured void and the discharge connector. The lower portion of the cleanable valve body, between the cylindrical heating element and discharge connector is contoured to remove metal to maximise the temperature in the downstream contoured void and the discharge connector.